Kevin Brickner
Vice President Safety and Operations Integration

August 1, 2017

Lorenda Ward
Investigator-in-Charge
Office of Aviation Safety
National Transportation Safety Board
490 L'Enfant Plaza East, SW
Washington, DC 20594

Re: American Airlines Party Submission re: American Airlines Flight 383; October 28, 2016; Chicago, Illinois; NTSB Investigation No. DCA17FA021

Dear Ms. Ward:

The purpose of this letter is to provide our proposed findings and recommendations to the National Transportation Safety Board ("NTSB") regarding the accident investigation and final report in this matter, in accordance with Title 49 Code of Federal Regulations ("CFR") Section 831.14. American Airlines ("American") appreciates the opportunity to submit these comments, as well as the professional and collaborative environment amongst all parties throughout this investigation. These cooperative efforts demonstrate our common commitment to aviation safety.

I. INTRODUCTION

On October 28, 2016, at about 14:32 CDT, American Airlines flight number 383, a Boeing 767-300, registration number N345AN, powered by two General Electric CF6-80C2B6 turbofan engines, experienced a Number 2 (right) engine uncontained High Pressure Turbine ("HPT") failure and subsequent fire during the high speed regime of the takeoff ground roll on runway 28R at Chicago O'Hare International Airport (ORD). The flight crew rejected the takeoff near V_1 and stopped the aircraft on runway 28R. All 161 passengers and 9 crewmembers successfully evacuated. The aircraft was a total loss due to extensive fire damage.

The flight was operating under Title 14 CFR Part 121 as a scheduled flight from ORD to Miami International Airport.

American is proud of the way its pilots and flight attendants handled this event. Through this submission, we describe the rigorous safety protocols and training programs in place at American Airlines and highlight several issues important to understanding this event and to enhancing safety throughout the industry.

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II. SUMMARY OF PROPOSED FINDINGS

- The initiating event was the sudden and uncontained fracture of the HPT second stage disk, due to a manufacturing defect or anomaly, which damaged the wing, fuel line, and other parts of the aircraft and triggered a fuel-fed fire.

- Prior to the accident, American Airlines inspected the HPT disk at issue in accordance with the procedures that were required by the Federal Aviation Administration ("FAA"), specified by General Electric ("GE"), and accepted within the industry.

- The guidance and procedures for engine maintenance and inspections available to American at the time that it inspected the subject HPT disk were incapable of detecting the type of subsurface manufacturing defect (anomaly) identified in the accident HPT disk.

- American Airlines has in place a robust safety culture, sound training programs for pilots and flight attendants, and well-proven normal and emergency flight procedures and Standard Operating Procedures ("SOPs").

- The cockpit crew properly rejected the takeoff and promptly followed procedural guidance and checklists in responding to the emergency. The pilots' judgment and skill significantly contributed to a successful outcome.

- The flight attendants performed a successful evacuation of all passengers and crew, despite concerns for their own personal safety. The cabin crew's judgment, skill, and self-discipline likely prevented significant injuries.

- The crew completed the evacuation within approximately 2 minutes and 21 seconds of the aircraft coming to a stop, which included time necessary for the pilots to run the appropriate engine fire, shutdown, and evacuation checklists.

- The decision by several flight attendants to initiate the evacuation was timely and prudent under the circumstances, and consistent with American Airlines policy that any crewmember may initiate an evacuation.

III. DISCUSSION

American Airlines prioritizes safety. This fact is perhaps no better demonstrated than by the rigorous training and exacting operating standards that contributed to the safe and successful outcome for flight 383. American Airlines thoroughly reviewed the available information related to this accident, including the information produced by the NTSB investigation. We

discuss below several issues that we believe are relevant to the NTSB's ultimate analysis of the facts and circumstances of this accident.

The Right Engine Failed Without Warning Due to a Manufacturing Defect

The initiating event for the accident was the sudden and uncontained fracture of an HPT second stage disk due to a manufacturing defect or anomaly. The uncontained fracture damaged the wing, fuel line, and other parts of the aircraft and triggered a fuel-fed fire. These events are well-documented by the NTSB's Airworthiness Group Chairman's Factual Report and the Materials Laboratory Factual Report and need not be discussed further in this Submission.

The FAA-Required Inspections that American Performed Could Not Identify the Defect

Prior to the accident, American personnel inspected the HPT disk at issue twice. American performed the last inspection, at the required interval, at the American Airlines maintenance facility in Tulsa, Oklahoma. American's inspection of the disk occurred at 7,927 cycles since new and 3,057 cycles before the event. At that time, GE and FAA AD 2009-04-10 required Fluorescent Penetrant Inspection and Eddy Current Inspection, which American accomplished in accordance with the GE Engine Shop Manual, with no adverse findings.

American Airlines performed pre-accident nondestructive testing and inspection procedures recommended by GE and required by the FAA. These procedures, however, were incapable of identifying the subsurface defect (anomaly) or associated internal fatigue cracks revealed by post-accident destructive testing. Indeed, Fluorescent Penetrant Inspection and Eddy Current Inspection procedures are effective in detecting surface or near-surface metal fatigue cracks, but not in detecting subsurface defects or associated internal fatigue of the nature found in this instance. Prior to this accident, GE believed that such inspections were sufficient in light of its manufacturing quality control processes and the operational history of the CF6 design.

The NTSB's metallurgical study indicates that there was no crack in the disk bore surface during the last inspection, though the subsurface defect existed at the time. Thus, the GE-recommended inspection procedures that American personnel followed were not capable of detecting the subject disk's particular internal flaw. After the accident, GE released Service Bulletin 72-1562 which provides a new method for immersion ultrasonic testing of certain CF6-80C2 engine HPT disks to help detect internal metallurgical defects like those involved here. American Airlines has now incorporated this new inspection for all of its affected GE engines.

American Airlines Adheres to Robust Training and Operating Standards

American Airlines has a robust safety culture, sound training programs for pilots and flight attendants, and well-proven normal and emergency flight procedures and SOPs.

American's training programs are among the best in the industry and are conducted at state-of-the-art facilities.

American Airlines previously produced documentation that confirms that the pilots and cabin crew for the accident flight were current on all training and that the normal and emergency procedures were well-documented in the aircraft-specific training guides, operational manuals, and checklists.

A) Advanced Qualification Program

American utilizes an FAA-approved Advanced Qualification Program ("AQP") to facilitate a proficiency-based initial training regime. Through AQP, American tailors all training to ensure that every pilot and flight attendant is fully qualified, and areas of focus are constantly evolving based on data-driven feedback about crew performance and daily flight operations.

The American Airlines AQP qualifies pilots, flight attendants, and dispatchers by training them to required proficiency standards. A flight crewmember is trained until he or she meets predetermined qualification standards, as permitted by Part 121, Subpart Y, of the Federal aviation regulations and FAA Advisory Circular 120-54, as amended. A crewmember or employee is only deemed qualified upon meeting all proficiency objectives, which are systematically developed and continuously evaluated by utilizing empirical, system-wide operational data. For pilots, AQP requires a minimum instruction time of 77 hours in ground school and 62.5 hours in simulator instruction. Additional training time is provided on an individual basis, as needed to meet training standards. Thereafter, all captains and first officers gain additional line operating experience with instructor pilots serving, respectively, as the first officer or captain.

All flight service training programs are approved and documented in the AQP. Flight attendants spend six and one-half weeks in initial and qualification training. The program incorporates blended learning, with web-based training, scenario-based training, workshops, lectures, simulated flights, initial operating experience, and knowledge validation.

Additional flight attendant AQP training qualifications include transition training on a new aircraft with an estimated average time of nine hours (three hours in pre-arrival distance learning; six hours hands-on/instruction at the training facility). Also covered is overwater ditching training with an estimated average time of 12 hours (three hours in pre-arrival distance learning; nine hours hands-on/instruction at the training facility). Additionally, flight attendants receive aircraft differences training with an estimated average time of four hours (two hours in pre-arrival distance learning; two hours hands-on/instruction at the training facility).

B) Continuing Qualification Program

Following initial qualification under the AQP, American requires that all pilots and flight attendants receive regular training and evaluation through its Continuing Qualification ("CQ") program. CQ is the means by which American Airlines ensures that all of its pilots and flight attendants maintain the highest standards of proficiency essential to safe line operations.

For pilots, aircraft-specific CQ includes: distance learning or computer-based training modules, aircraft-specific systems and procedures review, maneuvers validation, line operational evaluations, and line checks. CQ is divided into segments. Distance learning is conducted in four quarterly intervals for a total minimum of just over ten hours yearly. Other aircraft-specific and general subjects' ground training is covered on a nine-month cycle with three and three-quarters hours minimum time. Each CQ cycle also includes 13 hours of simulator instruction/evaluation time. Additional training time is provided on an individual basis as needed to meet training standards.

Any substandard performance by a pilot during an evaluation will result in additional training and re-evaluation to ensure the pilot meets applicable standards prior to continuing in training or being assigned to line flying.

CQ training for pilots includes:

- *CQ Distance Learning (RDL).* Accomplished annually by completing the four quarterly Distance Learning Courses (Courses 1, 2, 3, & 4) and including a non-aircraft-specific portion of CQ ground training.

- *CQ Ground and Flight Training/Evaluation.* Accomplished in nine-month intervals during a pilot's CQ base month.

- *Random Line Checks.* Random line checks are conducted by check airmen and are not announced to the flight crew in advance of the day's line check.

- *CQ Line Checks.* CQ line checks are conducted at a minimum of once every 24 months for each pilot.

Flight Attendants spend an estimated average of 18 hours in annual CQ training. This incorporates blended learning with eight hours in pre-arrival distance learning and ten hours hands-on/instruction at the training facility. Training components include a variety of topics on general procedures, emergency procedures, medical/first aid, security, firefighting, decompression, ditching, emergency equipment, evacuation procedures, door operation, and general safety culture.

C) Training Staff

The current American B767 check airmen cadre has a combined 530 years of teaching experience, with an average of nearly ten years per instructor pilot. The most junior check airman has flown for American for 27 years, and most have more than 30 years of experience flying for American Airlines.

Flight Attendant training programs are presented and facilitated by full-time and part-time flight service instructor/evaluators. There are currently 211 instructor/evaluators on staff in Flight Service Training – 63 who teach on a full-time basis and 148 who teach part time and fly part time. The average flying seniority of instructor/evaluators is 20 years with most having a minimum of seven years of training experience. Instructor/evaluators undergo a rigorous multi-week initial qualification training and ongoing continuous education training in order to present regulatory (AQP) programs. Management frequently conducts facilitation and teaching calibration sessions, and observations of instructors, to ensure alignment, consistency, and quality for all aspects of our evaluation and training program.

D) Training Facilities

The accident flight crew was trained at the American Airlines Flight Academy in Fort Worth, Texas. The American Boeing 757/767 pilot training facilities include nine classrooms, five full motion simulators, ten briefing rooms and one fixed-base flight-training device. The simulators expose all pilots to both the classic and advanced cockpit displays that can be encountered in the American Boeing 757/767 fleet. Computer-based training is used for AQP training and is also available to all pilots for CQ aircraft systems review.

All flight attendant training takes place at American Airlines' training campus, Flagship University, in Fort Worth. Totaling just over 90,000 square feet, Flagship University is a state-of-the-art campus with 71 classrooms/lecture rooms, three fully functional aircraft cabin training devices (five total planned), 15 aircraft door training devices (18 total planned), and three cabin emergency evacuation training devices (five total planned).

Training programs conducted on-site at Flagship University include crewmember initial qualification training, CQ training, aircraft qualification training, purser (lead flight attendant) qualification training, and other professional development/non-regulatory courses. Cabin service training devices depict exact replicas of aircraft interiors for the MD80, B757 and B767 fleets (B737, A319, A321, B787, and B777 planned).

Cabin emergency evacuation trainer devices depict replicas of aircraft interiors for the A319/320/321 and B767 fleets (B737, A319/320/321, B757, and B787/777 planned) including, but not limited to, cabin crew/flight deck intercom phone systems, flight attendant panels/lighting controls, area call panels, emergency equipment, passenger seats, jump seats,

modified galleys/lavatories with fire-fighting and smoke simulation, storage closets, overhead bins, cabin service equipment, fully functional aircraft doors with the ability to block/jam/obstruct with fire or debris, cabin smoke and fire simulation, decompression/O_2 mask drop simulation, flight deck seating/simulated controls, and flight deck security doors. In addition, cabin emergency evacuation trainer devices and newly refurbished cabin service trainer devices will soon be retrofitted with an exterior visual display/motion system, creating routine and non-routine scenarios (e.g., emergency landings, fire, and water egress).

The Crew Was Highly Qualified

Both pilots were current and qualified in the accident aircraft. The Captain, who was the pilot flying, had an estimated 17,400 hours total flight time of which approximately 4,000 hours were in the B767, with 1,500 hours of those as pilot in command. The Captain had never before experienced an engine fire or rejected takeoff outside of simulator training. The First Officer, who was the pilot monitoring, was also highly experienced. He had an estimated 22,000 hours total flight time of which 1,965 were in the B767. The First Officer had been a check airman at a previous airline.

All seven cabin crewmembers were B767 current and qualified at the time of the accident. The flight attendants had completed their CQ training within 11 months of the accident, some within weeks prior to the accident. Their overall experience on the B767 aircraft spanned between 3 and 34 years.

The Flight Crew Effectively Managed the Emergency

The cockpit crew properly rejected the takeoff and promptly followed procedural guidance and checklists in responding to the emergency. Specific elements of this accident, i.e., normal takeoff, engine failure, rejected takeoff, engine fire, and evacuation, are trained in each initial qualification course and are reviewed and evaluated during CQ courses. The flight crew's judgment and skill significantly contributed to the safe and successful outcome.

According to the cockpit voice recorder transcript, the engine failure occurred at 14:31:43.5 CDT while the aircraft was accelerating toward rotation speed, as evidenced by a loud bang. The crew rapidly assessed the situation, not immediately knowing the source of the noise, and the Captain initiated a rejected takeoff within approximately 1.2 seconds. The aircraft was brought to a complete stop in approximately 25 seconds, and the crew immediately initiated appropriate non-normal checklists.

As the crew was stopping the aircraft and performing checklist items for the rejected takeoff, the tower controller informed them of the presence of fire on the right wing. The crew immediately shifted from a rejected takeoff scenario to an engine fire response. They executed memory items for an engine fire and completed those items within seconds. Over the course of the uncontained engine failure and rejected takeoff and what followed, the crew managed four

distinctly separate responses, moving from one checklist to the next without hesitation. With each new piece of evidence, the crew reacted quickly and appropriately, transitioning as necessary to additional checklists, culminating in a call for the evacuation checklist less than one minute after the aircraft was stopped.

American Airlines believes the flight crew demonstrated commendable judgment and skill throughout the event.

The Cabin Crew Followed Training and Executed a Near-Perfect Evacuation

The cabin crew promptly initiated and then steadfastly supervised a very effective emergency evacuation. Each cabin crewmember ensured the safe evacuation of passengers at their respective exit doors, and then ensured no passengers remained in the areas served by their respective exit doors, before exiting the aircraft.

Many passengers reacted immediately to the loud "bang" and visible fire on the right side of the aircraft as the engine came apart. Some passengers exited their seats even before the aircraft came to a stop and moved to the opposite side of the cabin away from the fire. The cabin crew, particularly in the aft section of the aircraft, could likewise see the fire outside the right-side windows.

Despite the obvious stress associated with these circumstances, including concerns for their own personal safety, the flight attendants steadfastly remained at their duty stations and professionally led the evacuation until the last passengers exited the aircraft. The crew also adhered to their training, blocking certain emergency exits and redirecting passengers away from egress routes that were unsafe due to the presence of fire or other adverse conditions.

Finally, and importantly, the cabin crew properly initiated the evacuation, without waiting for the flight deck to issue the order. The crew completed the evacuation within approximately 2 minutes and 21 seconds of the aircraft coming to a stop, which includes the time necessary for the pilots to run the appropriate engine fire, shutdown, and evacuation checklists and exit themselves. American empowers all crewmembers with the discretion to order an evacuation for safety purposes, and, under the exigent circumstances with visible smoke and fire, it was clearly appropriate for the cabin crew to initiate the evacuation without delay. The cabin crews' decision to immediately initiate an evacuation was therefore consistent with American Airlines policy and likely significantly contributed to a safe outcome for all persons who were aboard.

The Utility of Aircraft Intercom Phone Systems Should Be Improved

Several flight attendants reported attempting to call the pilots, but then abandoning their attempts for reasons that included difficulty dialing the right code and the decision to focus on exigent circumstances in the cabin. Thus, although three flight attendants picked up cabin intercom phones with the intention of contacting the pilots and informing them of the start of an evacuation, none of those three calls were completed. Consequently, the flight attendants did not speak with the cockpit crew until the evacuation was nearly complete.

While American believes that both the cockpit and the cabin crews were each appropriately focused on the most urgent tasks each faced at the time, this event has highlighted certain impediments to effective intra-crew communication. For example, differences in original equipment intercom phone designs, even across single fleets, can lead to confusion, especially when trying to recall unique operating characteristics during moments of high stress or urgency. In the short term, American is installing enhanced training aids, to include mockups of each specific type of intercom phones installed on its fleet and sub-fleet variances, for use during AQP and CQ training by all flight attendants. In addition, we are collaborating internally with our safety department, departmental leadership, and our crew unions to review all handset procedures with a focus on uniformity and simplicity, and to ensure that posted instructions are clear and easy to follow in an emergency.

Opportunities Exist to Enhance Evacuation Protocols Industry-Wide

Notwithstanding the success of the evacuation and the crewmembers' commendable performance, American convened an interdepartmental task force to review all of its evacuation-related policies and procedures. Harnessing the power of our robust Safety Management System, our extensive Flight Operations Quality Assurance program, as well as training and other data, we expect to identify appropriate opportunities to hasten checklist flow for important evacuation-related decisions, such as expeditiously shutting down engines that might interfere with evacuation slides, and simplified commands to accelerate crew coordination. We expect to share any such improvements with original equipment manufacturers and other industry stakeholders.

American has also enhanced its crew training to increase awareness of specific issues amidst an emergency evacuation. Our AQP and CQ human factors and simulator training emphasize the issues associated with initiating an evacuation while the engines are still operating.

American remains concerned about passengers who attempt to evacuate with carryon luggage and other non-essential belongings. As consistently seen elsewhere during evacuations, our crew was forced to confront a visible minority of passengers who ignored instructions to leave luggage behind. American Airlines believes this is an issue that warrants additional

industry attention, given the risks that non-compliant passengers pose to themselves and others by slowing the evacuation and, potentially, puncturing and deflating critical escape slides.

IV. CONCLUSION

American Airlines respectfully submits that the probable cause of this accident was a manufacturing defect in the HPT second stage disk that was introduced during the alloy forging process that was undetectable in service using the manufacturer-recommended and FAA-required inspection techniques. Contributing to the severity of the accident was the release of high-energy segments of the fractured disk which resulted in additional aircraft damage and rapid propagation of a fuel-fed fire.

American Airlines has a robust safety culture, sound training programs for pilots and flight attendants, and well-proven operational and maintenance procedures. These aspects played a significant role in ensuring that the challenges faced by our passengers and crew aboard flight 383 were managed to a safe resolution. American Airlines is proud of the skill and professionalism demonstrated by our crewmembers and grateful for the trust our customers and employees place in us every day. We are committed to excellence in all aspects of our work.

We thank the NTSB for its work and the opportunity to contribute to this investigation.

Sincerely,

[redacted]

Kevin Brickner
Vice President Safety and Operations Integration

cc: Representative, Federal Aviation Administration
Party Coordinator, Allied Pilots Association
Party Coordinator, Association of Professional Flight Attendants
Party Coordinator, Transport Workers Union
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